A SPURLESS VARIETY OF HABENARIA PSYCODES (L.) SW.

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For several years a certain colony of orchids has been observed near Bay View, Michigan, by Dr. Chas. H. Swift of the University of Chicago, which, on account of the marked variation in the flower and the apparent constancy of one form, has prompted a critical examination of all available material of related species, as well as a review of the literature pertaining to the general subject of variation in the genus *Habenaria*. Of the three specimens from the above locality, which were secured by Dr. Swift and now preserved in the herbarium of the Missouri Botanical Garden, one accords in every detail with typical specimens of *Habenaria psycodes* (L.) Sw.; that is to say, the labellum is distinctly 3-lobed, and the lobes are fringed to less than one-third their length, the terminal lobe being somewhat emarginate; the petals are more or less denticulate, and the spur about equals the ovary (pl. 5, fig. A).

A somewhat intermediate condition as to floral structure is shown by the second of the three specimens (fig. B), the variations being as follows: the labellum is broadly emarginate and wedge-shaped in outline, and the lateral lobes are entirely wanting; the petals are entire, and the spur is considerably shorter than the ovary. Moreover, the flowers of the spike are extremely variable in respect to margin of lip and length of spur.

This form may be designated as:

Habenaria psycodes (L.) Sw., formal var. **varians**, n. var. Petalis lateralibus integris; labello cuneato late emarginato haud trilobato; calcari quam ovario breviore. — Near Bay View, Michigan, July, 1913, *Dr. Charles H. Swift* (Mo. Bot. Gard. Herb. No. 710165), TYPE.

An extreme variation of the type is shown by the third specimen. This differs from *H. psycodes* in having an undi-

vided, entire, and slightly saccate lip, entire petals, and by the complete absence of a spur (fig. C). This variety has maintained itself through several years, and seems deserving of record, as follows:

Habenaria psycodes (L.) Sw., var. **ecalcarata**, n. var.

Caulis 4–5 dm. altus, 3–4-foliatus; foliis inferioribus lanceolatis vel oblanceolatis, 1.5–2 dm. longis, 1.3–4.5 cm. latis, superioribus gradatim reductis bracteiformibus; racemo circiter 12 cm. longo, plus minusve secundo, bracteis lineari-lanceolatis floribus plerumque longioribus; floribus numerosis ecalcaratis; sepalis oblongo-ellipticis ca. 6 mm. longis, 2 mm. latis, obtusis; petalis lateralibus oblongis ad basim obliquis sepalis paulo brevioribus; labello oblongo indiviso integro parum saccato, marginibus non nihil insolutis; ovario 8–10 mm. longo.

Stem 4–5 dm. high, 3–4-foliate; lower leaves lanceolate or oblanceolate, 1.5–2 dm. long, 1.3–4.5 cm. broad, the upper gradually reduced, passing into linear-lanceolate bracts; inflorescence about 12 cm. long, more or less secund; bracts linear-lanceolate, mostly longer than the flowers; flowers numerous, ecalcarate; sepals oblong-elliptic, about 6 mm. long, 2 mm. wide, obtusish; lateral petals oblong-oblique at base, a little shorter than the sepals; lip oblong, undivided, entire, slightly saccate with somewhat infolded margins; ovary 8–10 mm. long.—Near Bay View, Michigan, July, 1913, *Dr. Charles H. Swift* (Mo. Bot. Gard. Herb. No. 701166), TYPE.

The literature relating to the subject shows a number of parallel cases of variation in other species of *Habenaria*. Ogden[1] records a variety of *H. ciliaris* in which the lip is either entire or imperfectly fringed and the spurs are mostly lacking. About the same time Mr. Henry G. Jesup[2] described and illustrated an interesting variation in *H. fimbriata* in which the long and prominent spur of the species is lacking and the sepals and petals are entire and all alike except in two or three flowers on one of the spikes, where there was a slight suggestion of a fringed lip. In 'Pflanzen-Teratologie,'

[1] Bull. Torr. Bot. Club **20**: 38. 1893.
[2] Bot. Gaz. **18**: 189. 1893.

Vol. II, Dudley writes that in many specimens of *H. hyperborea* flowers have been found without spurs and with the labellum like that of *H. dilatata.*

The question arises: Are our new varieties products of spontaneous variation (mutability), or have they been evolved from the ever-present fluctuating variations which a species offers as material for natural selection to work on? According to the latter and more conservative hypothesis the extreme variation, namely, var. *ecalcarata,* fig. C, owes its existence to the "gradual summation of small deviations in one direction, through succeeding generations," the intermediate formal variety *varians,* fig. B, indicating a transitional form in the series. These small deviations (fluctuating variations) being useful, according to the theory, offer the essential material which natural selection has gradually accumulated in one direction, resulting in an extreme type like our variety *ecalcarata.* This slow formation of species would necessarily require a long period of time. The existence of intermediate forms, like our formal variety *varians,* would seem to furnish proof for this conservative belief in the slow formation of species.

On the other hand, variety *ecalcarata* may be regarded as a probable mutant from *H. psycodes;* and the formal variety *varians* may then be a hybrid between the species and the extreme variety. An experimental proof could be attempted in this case. In favor of this view it may be said that the sudden origin of new forms other than by a series of transitional stages is in accordance with the facts of plant breeding. De Vries derives the doctrine that variability may be increased by selection; one of the chief objects of his book, he says, is "to try to show that ordinary or fluctuating variability does not provide material for the origin of new species." He speaks of the "illusion of an increase in variability." The existence of intermediate forms, according to the conservative view, is usually pointed out as filling the gaps between the discontinuous series that species form. De Vries says, however, that these are not transitional forms, but are independent types, which he calls elementary species

(mutations). If, as a result of experimentation, we are forced to deny the existence of transitional forms as such, then that fact along with the fact of the existence of apparently useless characters suffices, according to him, to beset the selection theory with serious difficulties.

Accordingly, a third possible suggestion might be offered, namely, to consider both varieties as elementary species, simultaneous mutants from *H. psycodes*. Since no new characters have been added, they would be what De Vries calls retrogressive; he even states that "there are possibly more species on the face of the earth at present that have arisen on retrogressive than on progressive lines—just as it is held that the monocotyledons have arisen from the dicotyledons by the loss of a whole series of characters."

In his paper on 'Die Bedeutung sprunghafter Blütenvariationen für die Orchideenflora Südbrasiliens,' Porsch tells how certain species of orchids brought over to Germany by Prof. Wettstein from southern Brazil entered on a sudden period of mutation, and that under his very eyes he saw the origin of several elementary species. He attributed the induction of the period of mutability to the external factors of a changed condition of nourishment. He states that although he does not believe that mutation is the only way by which new forms may originate, yet he thoroughly believes in spontaneous variability as the species-forming factor in the orchid family. It may not be impossible that the species *H. psycodes* is in a period of mutability; experimental studies alone could decide.

In his 'Pflanzen-Teratologie' Penzig mentions three spurless varieties of *H. ciliaris*, *H. fimbriata*, and *H. hyperborea*, respectively, as cases of peloria. Examples of pelorism among orchids seem to be not uncommon. Peloria is a term first used by Linnaeus to describe the five-spurred flowers of *Linaria vulgaris*, newly discovered at that time. The name is derived from the Greek word for monster. It is now applied by botanists to all flowers which pass from irregularity to regularity. The lip of an orchid is really a petal which has become irregular in form, and in the two genera

Orchis and *Habenaria* the lip is prolonged backwards into a spur, which adds further to the irregularity. Through the loss of a spur or of other irregularities, the flower may assume a regular form. Cases have been recorded also of three-spurred orchids. Hill[1] describes *H. lacera* var. as having three spurs and two lips, and one of the lips again dividing as if to maintain the tri-formity. Two columns were also present.

Cases of false peloria have also been found in which two extra spurs were produced by the lateral sepals and not, as in cases of true peloria, by the lateral petals. Abnormalities such as these are especially interesting in the case of the orchids. The pelorias consist chiefly either in the loss of the spur, or else in an increase in the number of spurs to three. In either case this tends to make the flowers pass from zygomorphy to actinomorphy, and the latter condition is probably more primitive than the present irregular form. Regularity must be a latent yet heritable character in orchids, and the loss of it in this extremely complex and highly differentiated family is only apparent, since it shows a not uncommon tendency to return to its full activity in these peloric forms. Our concern is whether this latent character has returned to activity suddenly, or whether by a slow and gradual recovery of the former features. Pelorism is a phenomenon where the capacity to form irregular flowers has been reduced to a latent or inactive state. Conditions of nutrition are thought to be the external cause in inducing the appearance or non-appearance of the monstrosity.

Hundreds of steps have probably been necessary in the evolution of the orchid family. The variety with which we are now concerned, therefore, and others, may be considered as a reversion toward an ancestral condition on the part of the species exhibiting it—a reversion which seems an offset to the extreme specialization to which orthogenesis or adaptation has led the family. Monstrosities as commonly understood are now generally regarded as visible manifestations of a heritable, though for the most part latent, potentiality, and are retrogressive phenomena.

[1] Bot. Gaz. **15**: 145. 1890.

EXPLANATION OF PLATE

PLATE 5

Fig. A. *Habenaria psycodes* (L.) Sw.
Fig. B. *Habenaria psycodes* (L.) Sw., formal var. *varians*, n. var.
Fig. C. *Habenaria psycodes* (L.) Sw., var. *ecalcarata*, n. var.